Editor's Spotlight/Take 5

Editor's Spotlight/Take 5: Growth Plate Alteration Precedes Cam-type Deformity in Elite Basketball Players (DOI 10.1007/s11999-012-2740-6)

Seth S. Leopold

There are some topics in orthopaedic surgery that are almost unbelievably complicated. Hip

impingement is one. How high-intensity sport affects the developing body is another. The open-minded surgeon will concede that on these two topics we have many more good questions than we have answers.

In light of that, we highlight the work by Dr. Klaus-Arno Siebenrock and colleagues, which “makes a strong move into the paint,” by studying two hard problems at once.

Siebenrock et al. found that high-level adolescent basketball players appear to remodel their proximal femoral physes in concerning ways. The changes they observed to morphologic features of the hip are especially prominent in adolescents whose physes are open. But, importantly, they even saw differences in young athletes whose growth plates had already closed. The patterns of remodeling observed on MRI raise reasonable concerns about the risk of cam-type femoroacetabular impingement.

One has to be careful not to oversimplify, nor to overstate. Even given the changes the authors saw in these ballplayers' proximal femurs, we do

not know whether they will have early arthritis develop, and it is possible that there are other explanations apart from the sport itself to account for the findings.

But let us assume that everything here is, more or less, as it appears—which strikes me as likely. Most of us do not treat pediatric patients or athletes with hip impingement. Many of us do not even treat athletes, at least not as the major focus of what we do. So, why care?

There are several reasons. Many of us have children, and all of us care about them, even if we do not provide care for them. In addition, we are all aware of the increasing pressures on children to play higher-level sports, at younger ages, with shorter periods of rest during the year. Fitness is good, but to the degree that we do not know “how much is too much” when it comes to high-intensity athletics among children and adolescents we need to support the research that will help us find out, and to advocate for those who cannot easily protect themselves from excesses when we see them.

Note from the Editor-in-Chief: In “Editor's Spotlight,” one of our editors provides brief commentary on a paper we believe is especially important and worthy of general interest. Following the explanation of our choice, we present “Take Five,” in which the editor goes behind the discovery in a one-on-one interview with an author of the article featured in “Editor's Spotlight.” The author certifies that he or a member of his immediate family has no funding or commercial associations (eg, legal, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article. All ICMJE Conflict of Interest Forms for authors and *Clinical Orthopaedics and Related Research*® editors and board members are on file with the publication and can be viewed on request. The opinions expressed are those of the writers, and do not reflect the opinion or policy of *CORR*® or the Association of Bone and Joint Surgeons®.

S. S. Leopold (✉)
Clinical Orthopaedics and Related
Research, 1600 Spruce Street,
Philadelphia, PA 19013, USA
e-mail: sleopold@clinorthop.org

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Take Five with Klaus A. Siebenrock, MD

Lead Author of: Growth Plate Alteration Precedes Cam-type Deformity in Elite Basketball Players

Seth S. Leopold MD: *How different were the athletes in your elite group from recreational basketball players? Talk to me about intensity, duration, rest periods during the year, fitness level, physical size, conditioning regimens, and anything that will help a reader know how to apply your results to athletic younger patients she or he might see in the office.*

Klaus A. Siebenrock MD: The level of intensity for the elite athletes was quite high. All basketball players in the elite group had participated on a competitive level without interruption since they were 8 years old, and training intensity increased with age. The training regimen started with three training sessions and/or games per week for the 9- to 12-year-old players, and progressed to eight sessions and/or games per week among the 16-year and older athletes. Rest periods during the year typically are not longer than 4 to 6 weeks.

The control group also included individuals who played recreational sports activities of all kinds, but only up to a maximum of 2 hours per week.

So the cut-off for potential harm to the physis presumably lies above the 2-hour limit, but has not been evaluated yet.

Dr. Leopold: *Do you have a sense for whether recreational basketball players might also be at risk for similar changes? Do you have any insight into whether it is participation in a high-impact jumping sport, intensity level, or both that cause changes to the proximal femur?*

Dr. Siebenrock: An increased prevalence for cam-type morphologic features in adolescents is not unique for basketball players. It has been described for various kinds of sports including soccer, ice hockey, running, and other activities. High-impact activities of various kinds seem to affect the developing proximal femur. I would be very surprised if intensity level does not also play an important role. I believe it is likely a combination of impact and intensity that are responsible for the changes. The most important issue to me, however, is the time over which changes to the growth plate were detected. Alteration of the physal extension occurred between the ages of 9 and 16 years, while the growth plate was still open. This seems to point out that there might be a vulnerable phase during children's growth in which high-impact sports played at

an intense level may promote abnormal growth. Ultimately, this abnormal growth seems to be linked to the development of a cam-type deformity, and the risk for early osteoarthritis of the hip.

Dr. Leopold: *Along a similar line, how might your findings have been influenced by physical size? Presumably the elite basketball players, in addition to everything else, were taller and heavier than the adolescents in your control group. Might that have increased the loads across their hips enough to influence femoral morphology through growth and development?*

Dr. Siebenrock: The basketball players were taller than the control group; however, the BMI only became significantly different in the subgroup of players with a closed physis. Since the physal changes were already found before closure of the growth plate, BMI does not seem to be the cause. A taller size in theory may transmit higher loads to the hip due to an increased lever arm, and this may aggravate abnormal changes. The increased prevalence of a cam-type deformity in other sports like soccer or ice hockey, where body height typically plays a smaller role, suggests that height might not be the predominant issue.

Dr. Leopold: *What kinds of followup studies do you think your study calls*

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for, and how long do you think it might be before we get answers to the key clinical questions—having to do with hip pain, impingement, and perhaps early arthritis—that your findings make us wonder about?

Dr. Siebenrock: We have started to perform longitudinal MRI studies to define normal development of the physis and to define the time where changes to the growth plate can be detected. This would help to specifically sort out athletes at risk who should be further monitored to detect persistent deformity and how many of them will have subsequent pain and hip impingement develop.

Dr. Leopold: *The way adolescent baseball is played—limits on pitch*

counts, and innings pitched, etc—was affected by research in some ways similar to yours. Do you imagine there may someday be restrictions on youth basketball players, and, if so, how might these come about?

Dr. Siebenrock: First, one has to spread the information that children and adolescents playing basketball and/or other high-impact sports at an elite level may be at increased risk for having a cam-type deformity develop. Ultimately, this puts them at higher risk for hip pain and early osteoarthritis. I would like to propose that in children and adolescents who play basketball, hip function should be monitored on a regular basis. This can be done by physical examination by a

well-trained physician or physical therapist, and should include ROM (especially flexion and internal rotation) and the presence or absence of a positive impingement test. Any abnormal finding should lead to further imaging studies, preferably MRI and consultation with an expert. Second, hip studies on a larger scale, especially involving athletes during the period of growth, have to be performed to better define patient and sport-related risk factors. At this point, the trigger for growth-plate alterations remains unclear—whether they are caused by general overload and/or by specific types of exercises, or hip motion. For these reasons, a specific restriction on youth basketball players cannot be given at this point.